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Nurse-led care interventions for high blood pressure control: Implications for non-communicable disease programs in Uganda

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ABSTRACT

Objective: The aim of the integrative review was to assemble the best available evidence for effective nurse-led care interventions for high blood pressure control (HBP) and, then seeks to identify effective evidence based strategies for adaptability in non-communicable disease programs in Uganda.
Material and methods: A literature review of 18 articles was undertaken using the Medical subject terms "hypertension/nurse", "Sub-Saharan Africa", "Nurse-led/Nurse run clinics" in Medline via PubMed and the Cochrane Central register of Controlled trials. We then set the search limits to include articles published in English, past five years, involving only human subjects and adults. Only articles that employed an intervention and involved a nurse/pharmacist or physician in primary, secondary and acute care setting were included for the study. The level and strength of the articles was appraised by using the Johns Hopkins Nursing Evidence-based practice appraisal tools.
Results: There is strong evidence to support nurse-led care interventions to be effective in the control of high blood pressure (HBP). There are a number of effective evidence based strategies for HBP control used by the nurses; patient/provider education, patient/provider reminder system, nurse prescribing, team based care, home BP monitoring and use of treatment algorithms.
Conclusion: Nurses play a significant role in the control of high blood pressure when they employ effective evidence based strategies in identification, prevention and management of hypertension. Adapting effective evidence based strategies in identification, prevention and management of non-communicable diseases could improve patient outcomes in Uganda.

Contents

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1. Introduction

Non-communicable diseases (NCDs) pose a significant global health burden in both developed and developing countries. Hypertension remains a significant cardiovascular disorder in Sub-Saharan Africa and is rising at endemic levels; representing a major public health concern. In under-resourced environment, overwhelming morbidity and mortality are associated with non-communicable diseases with less emphasis on their prevention and treatment. This is particularly true in Sub-Saharan Africa (SSA), where prevention and treatment focuses mainly on communicable diseases such as; malaria, HIV, and TB. In Sub-Saharan Africa, reliable data on hypertension incidence and prevalence are lacking (Twagirimukiza et al., 2011). It is estimated that by 2025, 41.7% of males and 38.7% of females in Sub-Saharan Africa will develop high blood pressure [HBP] (Addo, Smeeth, & Leon, 2007). Worldwide, this increase is associated with an increase in population growth, increased weight, physical inactivity, and low rate of public engagement in healthy nutrition (Twagirimukiza et al., 2011).

Low levels of detection (40%), low levels of hypertension treatment (less than 30%) and low levels of hypertension control (less than 20%) are reported to significantly contribute to the high prevalence of high blood pressure (HBP) in the Sub-Saharan Africa (Addo et al., 2007). Additionally, undetected and uncontrolled hypertension is a major contributor of cardiovascular events such as cerebral vascular accidents, myocardial infarctions, congestive heart failure, peripheral vascular disease and chronic renal failure (Baig, Mangione, Sorrell-Thompson, & Miranda, 2010; Bakris et al., 2007; WHO, 2010) leading to disability adjusted life years [DALYs] estimated at 8.1% in less developed countries (Fulwood, Guyton-Krishnan, Wallace, & Sommer, 2006; Glynn, Murphy, Smith, Schroeder, & Fahey, 2010; Murray et al., 2003).

2. Background

In Uganda, a country of 32 million people has overwhelming morbidity and mortality rate associated with both non-communicable and infectious diseases. Currently, undetected, poorly managed and uncontrolled hypertension is a major primary and public health care problem contributing to the NCD morbidity and mortality rates in Uganda (Maher, Waswa, Baisley, Karabarinde, & Unwin, 2011). A recent population-based survey in rural Uganda reported a hypertension prevalence of twenty-two percent (22%) (Maher et al., 2011). Moreover, the WHO reports that high blood pressure contributes to approximately 11% of cardiovascular disease mortality rates and 25% of all total deaths from non-communicable diseases in Uganda (WHO-NCD, 2011). Nine of 10 people (90%) in Uganda are unaware of their hypertension condition which may explain the low levels of documented and undetected hypertension in Uganda (Maher et al., 2011).

Hypertension carries a disease burden on individual patients, families, and communities (WHO-NCD, 2011; WHO, 2011). Moreover, hypertension is associated with poor quality of life, loss of productivity, and ultimately leads to a low social economic status of the whole country (WHO, 2011). It should be noted that Uganda still reports poor health indicators such as high maternal and infant mortality rates, and HIV prevalence stagnation linked to poor health care staffing ratios (WHO-NCD, 2011). The health work force in Uganda is miserably shorthanded with estimated figures of 1.2 physicians per 10,000 patients and 13.1 nurses and midwives per 10,000 patients (WHO-NCD, 2011). The ill distribution of the health workforce in Uganda is significant with observed urban and rural divide. Similar to other developing countries in SSA faced with health workforce shortages, Uganda plans to adapt the task shifting policy as viable alternative to solve the human resource crisis (Lekoubou, Awah, Fezeu, Sobngwi, & Kengne, 2010).

Considering that nurses and midwives make up the largest heath workforce in Uganda's health care system, the role of nurses in hypertension risk assessment, detection, prevention and treatment of hypertension needs to be expanded. Examples of successful nurses and midwives care models are reported in HIV care, immunization and maternal health (USAID., 2010). There is little or no evidence documented about the effectiveness of nurse-led care interventions in the control of high blood pressure in Uganda. Nevertheless, if the nurses' roles were expanded, better patient outcomes would be realized for non-communicable disease programs in Uganda. The purpose of the review paper is to assemble the available evidence on the effectiveness of nurse-led care interventions for high blood pressure control, and to identify effective evidence based strategies for adaptability in non-communicable disease programs in Uganda.

3. Materials and methods

3.1. Data sources and searches

An integrative review of the literature was undertaken to summarize the evidence on the effectiveness of nurse-led care interventions for high blood pressure control and to identify effective strategies for the high blood pressure control used by the nurses or physicians. A database search using Medical subject terms *hypertension/nurse, Sub-Saharan Africa, Nurse-led/Nurse run clinics* in Medline via Pub Med and Cochrane Central register of Controlled trials data bases was undertaken on December 2012 yielding 1986 potential studies. Medline database was used because of its wide coverage of studies involving health care interventions for control of blood pressure. Whereas, the Cochrane database was chosen because it is a repository for evidence based practice guidelines and studies considered to be of good quality.

3.2. Study selection

The studies selected were reviewed by their titles and abstracts in cognizance of answering the PICO (Patient/population; Intervention/interest area; Comparison intervention or standard of care and Outcomes) review questions. The two PICO review questions to be answered were: "What evidence is available for the effectiveness of nurse led care interventions in the control of high blood pressure?" and "What effective evidence based strategies are used by nurses or physicians in the control of high blood pressure?" Studies that did not meet the first inclusion were automatically excluded for this review study. After identifying duplicates and removing them, sixty (60) studies met the initial screening process. Full texts were then obtained and a detailed assessment of the studies was initially conducted by the author (GK) who was familiar with the

Table 1
Description of Outcomes Evaluated.

#	1st author	Year	Level of research (or non-research) evidence	Sample composition & size	Results/recommendations	Limitations	Rating Strength Quality
1	Fahey, T.	2005	Cochrane systematic review	56 RCTs Adults. Patients with essential HT (Treated or not currently treated with BP lowering drugs) – Primary chore, out patient or community setting • **Interventions** – Self monitoring, – Educational intervention directed to the patient – Educational intervention directed to the Health professional – Health professional led care – Organization intervention – Appointment reminder	19RCT-randomisation process 6RCT-adequate allocation concealment 11 studies-blind to treatment allocation 20% follow up loss in 12 studies *__Self monitoring__ (n = 15RCTs) was associated with significance decrease of mean systolic BP (SBP) – 12RCTs reported significant difference of mean diastolic BP (DBP) reduction of 2.0 mm Hg – 4RCTs-No significant reduction – Other RCTs reported a mean arterial blood pressure difference of 3 mm Hg in favor of the intervention *__Education interventions (patients__) (16RCTs) – 7RCTs reported mean diff SBP – 9RCTs reported mean diff DBP – 5RCTs reported BP control – 3RCTs did not have outcome data – 1RCT reported an improvement in SBP but NOT in DBP at 6months follow-up • **Education intervention (physician)** 9RCTs reported a small reduction in SBP (2.0 mm Hg) No significant decrease in DBP • **Health professional led care (*n* = 7RCTs)** 5RCTs reported significant mean difference in SBP (−13 mm Hg) 6RCTs mean difference in DBP (−8.0 mm Hg) • **Organizational Intervention** (n = 7RCTs) – Hypertension detection and following program (HDFP) produced substantial reduction in SBP and DBP – 5year follow up were associated with a significant reduction in all cause mortality • **Appointment reminder system** (n = 6RCTs) – 5RCTs reminder system associated with improvement in follow up – 1RCT of a mailed post card not associated with improved follow up – 4RCT reported that other interventions were associated with a significant improved in follow attendance by patients • **Recommendations** – Free care, Registration, recall and regular review with a rigorous stepped care be emphasized – Self monitoring is associated with significant decline in DBP and further evaluation is warranted – Education alone directed to patients or health professionals appears unlikely to influence control of blood pressure as a single intervention – Use of health care professionals such as nurses and pharmacists was associated with improved control of BP	Not possible to distinguish between the independent effect of the intervention or BP – Several RCTs included both treated and untreated patients – Many RCTs had multifaceted interventions that did not fit into a single intervention category – Most RCTs didn't make any recommendations about the need for adjustment of target BP reading – Few trials examined the relationship between adherences to anti HT medication of control of BP – Not all RCTs report on the outcome BP level achieved	Level 1 A

2	Bosworth, H.B.	2001	RCT	*Eligible Patients with a diagnosis of hypertension and using BP lowering medication *Inadequate BP control (140/90 mm Hg) **Intervention** A=3telephone based interventions in 4group design (1) Nurse administered behavioral management interventions (2) Nurse administered, physician directed medication management intervention using a validated clinical decision support system (3) Combined behavioral management and medication management intervention (4) Usual care, individual selected for primary care patients in Durham, North Caroline, VA	Of the 591 study patients 48% were African American 92% were males, 5% of participants had their BP under control at baseline using standardized measurements – BP measurements were available for 503 participants – 85% at 18months Follow up • **BP control** Statistically significant in the behavioral management group and management at 12% (95%.CI 16% to 24.1%) • **Systolic and diastolic BP** Largest sustained improvement for SBP in the combined interaction group – By 18months, mean SBP for medication and combined intervention was better than usual care – Over half of patients enrolled (348) had adequate BP control at baseline – Individuals with adequate BP control at baseline continued to remain in control over 18months of the study – The SBP was significantly lower than in the medication (management arm at 12 months −9 mm Hg (95%cl −14.5 to −1.4, $p = 0.02$) relative to usual care – Diastolic BP decreased in the medication management arm by 4.2 mm Hg (95%cI, 15.5 to 0.5, $p = 0.04$) – 13.2 minutes was mean time spent by nurses on each completed encounter – 12.0 minutes behavioral management – 13.9 minutes-medication management – 13.7minutes combined intervention • **Cost of intervention and medical resources** – $984 behavioral management – $1275 medical management – $1153 combined intervention arm – Nurse led interventions for hypertension, nurse prescribing showed greater reduction in BP • **Recommendations** *Nurse led intervention demonstrates improvement of hypertension management in the short term and among carefully and selected group *Behavioral led medication management groups have a significant improvement in BP control relative to usual care group at 12months	*Discrepancy between BP values obtained – Standardized BP measurement not followed in some studies – Difficulties in telling to what degree white coat effect affected BP readings – Post Hoc analysis was not initially planned – Lack of accessibility to PHC	Level 1 A
3	Baig, A.A.	2010	Randomized Community based intervention trial	– Sample was100 adults **Intervention** (1) Referral to faith community nurse after randomization (2) Or telephone assisted physician appointment after randomization	– The follow-up rate was 85% at 4 months – Patients in the faith community nurse referral arm had a 7 ± 15 mm Hg drop in SBP versus a 14 ± 15 mm Hg – drop in the telephone-assisted physician appointment – arm ($p = 0.04$) – Twenty-seven (27%) percent of the patients in the faith community nurse referral arm had medication intensification compared to 32% in the telephone assisted Physician appointment arm ($p = 0.98$) – No significant deference between hypertension knowledge and hypertension self –care for both two arms	– Study not generalizable – Possibility of contamination to have blood pressure checked – Cannot rule out the possibility of social desirability bias – Blood pressure outcomes may reflect the counseling received instead of the referral process	Level 1 B

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Table 1 (*continued*)

#	1st author	Year	Level of research (or non-research) evidence	Sample composition & size	Results/recommendations	Limitations	Rating Strength Quality
					– No significant difference in hypertension medication intensification in both arms (27% vs. 32%, $p = 0.62$) **Recommendations** Providing telephone assistance with making appointments with a primary care physician led to a greater reduction in systolic blood pressure for individuals With elevated blood pressure from a health fair than did direct referral to a faith community nurse **Counseling** The participants in the faith community nurse referral arm were significantly more likely to report both dietary and Physical activity counseling – Since nurses cannot prescribemedications, our finding may point to the importance of prescribing antihypertensive medications in lowering systolic blood pressure		
4	Murray, C.J.	2003	Systematic and meta-analyses	17 Non personal and personal health service interventions or combination **Non personal health interventions** health education through mass media **Personal health intervention** – detection and treatment of people with high concentration cholesterol high systolic BP Absolute risk approach **Combination of Non personal and personal interventions** **Cost analysis** Associated with running the intervention	– All 17 interventions in 3regions cost effective – Non-personal health interventions reduce blood pressure and cholesterol and are very cost effective – Effect of non-personal health intervention depends on risk factor distribution in the region – Personal health strategies have great potential to reduce the burden of disease even though slightly less cost effective than population wide strategies – Treatment based on measure BP or cholesterol cannot alone be preferred option on grounds of cost effectiveness – Combined non personal and personal interventions more costly and more effective the single personal option	Results mainly based for Finland	Level 1 A
5	Magid	2011	Prospective study RCT	Patients with hypertension taking 4 Or fewer anti hypertensive medication **Four main interventions**, – Patient education – Home BP monitoring – Home BP measurement reporting to IVR phone system – Clinical, pharmacist management of HT with physician oversight – 94% of intervention participant uploaded BP at least 1 time	Of 338 patients enrolled 283 (84%) completed the 6month visits Mean age of patients was 62years – 1/3 were female – 2/3 white race – Slightly more than 50% had diabetes and chronic kidney diseases – Mean BP were similar at 6months – No difference between intervention Vs usual care group in the proportions achieving BP goals (36% Vs 35.2% $p = 0.89$) – Intervention group had a greater increase in the number of hypertensive medication intensity (0.3Vs 0.1 $p = 0.05$) – Medication intensity was not associated with BP control ($p = 0.32$) – Multimodal intervention compound of patients, education, home BP monitoring, home BP measurement reporting to IVR phone system and clinical pharmacist management led to greater BP reduction compared to usual care – Encouraging self care through home BP monitoring and using clinical pharmacist with physician oversight can improve BP levels – Value of technology to help self care and to improve BP control	– Therapy intensification score was developed Post hoc – Study was conducted in integrated setting – Focus was on use of home monitoring to guide treatment intensification of patients with uncontrolled HT	Level 1 B

6	Pezzin L.E.	2010	Cluster randomized controlled trial	– 845 newly admitted patients with uncontrolled HTN (JNC 7 stage 1 & 2) – Three-arm community cluster **Intervention groups** – Usual care – Basic intervention – Augmented intervention	– Just above 1/5 of the patients in each arm achieved BP control at 3 months with no significant difference across all groups – Augmented group had significant relative improvement in stage 2 HTN at baseline than usual care (16% Vs 10%, p<0.05) – SBP was significantly lower at 3 months for augmented group than usual care stage 2 patients (−8 mm Hg, $p < 0.05$) – Basic intervention produced no significant BP improvements; – Augmented intervention increased BP control by 8.7 percentage points relative to usual care (8.9% vs. 17.6%; $p = 0.01$) – Augmented intervention yielded an 8.3 mm Hg relative reduction in SBP ($p = 0.01$), and increased the proportion achieving at least a 20 mm Hg reduction in SBP by 16.4 percentage points ($p = 0.01$) **Conclusion**: Among stage 2 patients, a nurse led intervention providing additional HTN medication review and patient self-management support during the 3-month post-acute care period yielded significant improvements in 3-month BP control, plus improvements in secondary BP outcomes	– High drop out – Possibility of selection bias-study based on black patients – Study results not generalizable – Randomization was at nurse level rather than patient level – Outcome were significant for stage 2 HTN patients – BP measurement was based on a 3 months duration	Level 1 B
7	Denver, E.A.	2003	Randomized clinical trial	– 120 men and women outpatient attendees – 61% non-caucasian with type 2 DM **2 Interventional groups** 1. Conventional primary care group (CPC) 2. Nurse-led hypertension clinic group (NLC)	– 93% Vs 98% CPC and NLC completed the study – 3 patients failed to attend the last visit – 1 patient died in the CPC group – NLC cohort showed a significant treatment change than the CPC at 6 months (88%Vs 15%, $p = 0.000$) – Magnitude of SBP lowered was significantly greater in the NLC than the CPC group – Target SBP and DBP were achieved in 38% Vs 12% and 50% Vs 36% of the NLC compared to CPC group at 6 months respectively – No change of CHD and stroke risk scores in CPC group – Significant fall in CHD and stroke risk scores for NLC group after 6 months **Conclusions/recommendations** – Nurse led approach to the management of uncontrolled hypertension in patients with type 2 DM is highly effective – Improved access to monitoring and pharmacological intervention facilitated by hypertension nurse appears to be central to the outcome of the study – greater reduction in BP in the patients allocated to nurse-led care was related to greater frequency of changes in treatment	Cost benefit of the approach not studied – possible selection bias	Level 1 A
8	Kotseva, K.	2010	Cross-sectional survey in 12 European Countries	– 66 general practices in 12 European countries – 5687 medical records reviewed – 4366 patients interviewed after start of drug treatment	– 4366 risk individuals – 57.7% of the females were interviewed – 16.9% smoked cigarettes – 43.5% has BMI greater or equal to 30kg/m^3 – 70.8% had BP greater or equal to 140/90 mm Hg (72.8% in men Vs 69.5% in females) – 30.2% reported history of DM – Risk factor control was very poor with only 26.3% of the patients using antihypertensive medication achieving BP goals – 30.6% on lipid lowering medication achieving cholesterol goals – About 22% of all the patients were on aspirin or other ant platelet medication **Conclusion** – life Style of people treated with high cardiovascular risk is a major concern – Persistent smoking, obesity and central obesity are prevalent – Primary prevention needs a systematic, comprehensive, multidisciplinary approach	Possible sampling bias Limitation in diagnostic characteristics	Level III B

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Table 1 (*continued*)

#	1st author	Year	Level of research (or non-research) evidence	Sample composition & size	Results/recommendations	Limitations	Rating Strength Quality
9	Whelton, P.K.	2002	Special communication from experts	National High Blood Pressure Education Program (NHBPEP) coordinating Committee Representatives from the 38 national professional public, and voluntary organization and 7 federal agencies	**Recommendations** – Prevention of hypertension by complimentary application of strategies that target the general population – Lifestyle intervention are more likely to be successful – Absolute reductions in risk of hypertension are likely to be greater when target population is older – Prevention strategies applied early in life provide the greatest long-term potential for avoiding precursors that lead to hypertension **Population based strategy** is an important component for any comprehensive plan to prevent hypertension – Public health approaches like lowering sodium content or caloric density in the food supply, providing attractive, safe, and convenient opportunities for exercise are ideal population-based approaches – Enhancing access to appropriate facilities such as parks, walking trails, bike paths and effective behavior change models is a useful strategy for increasing physical activity in the general population **Intensive targeted strategy** – Conducted in health care setting, senior centers, and faith-based organizations that have BP screening and referral programs		Level V A
10	McLean, D.L.	2008	Randomized controlled trial	14 community pharmacies in Edmonton, Alberta, Canada – 227 patients involved – Pharmacy-nurse teams – Intervention and control arms **Outcome** Difference in SBP in the 2 groups after 6 months	– SBP decreased in both arms during the 6 months but a greater reduction in the intervention group of 10.1 mm Hg Vs 5 mm Hg in the usual care group – Pharmacy and nurse based intervention that empowered patients to take charge of their BP, educated them about dietary and exercise approaches and opinion leader endorsed conferred a 5.6 mm Hg greater reduction in SBP after 6 months compared to usual care **Conclusions/recommendation** – Pharmacists who are accessible drug therapy experts should be engaged – There is need to value community pharmacists and nurse teams working in collaboration with the patients and physicians to achieve better BP control – Pharmacist-nurse teams should be considered because of the fact that primary care physicians are already overwhelmed – There is strong evidence that a community pharmacist and nurse team, working in collaboration with patients and primary care physicians can have major effect on hypertension management in patients with DM and suboptimal BP control in the community **Primary care physicians**		Level 1 A
11	Glynn, L.G.	2010	Cochrane collaboration random trials and systematic reviews	Multiple studies (RCTs) ($N = 72$) of interventions Population-Age 18 and above with essential hypertension (treated or currently not treated with hypertension lowering drugs	Effects of intervention **1. Self-monitoring** – Self-monitoring ($n = 18$RCTs), pooled data from 12RCTs show a significant reduction in SBP of −2.5 mm Hg (95%CI, 3.7 to −1.3 mm Hg). modest reduction in DBP in 14RCTs of −1.8 mm Hg (95%CI, −2.4 to −1.2 mm Hg)6 RCTs showed no improvement	– Some RCTs did not report relevant outcomes. – People received hypertension treatment in the two arms.Several RCTs included both treated and untreated No single intervention RCTs	Level 1 A

				Interventions – Self monitoring – Education interventions directed to the patient – Education intervention directed to the health professional – Health education (nurse or pharmacist) led care – Organizational interventions that aimed to improve the delivery system – Appointment remainder system	**2. Education directed to patients (*n* = 20RCTs)** – 11 RCTs reported mean difference in SBP – 13 RCTs reported mean difference in DBP – 7 RCTS reported BP control **3. Education directed to the physician (*n* = 10 RCTs)** – No significance decrease in mean SBP and DBP, −0.4 mm Hg, 95% CI, −1.1 to +0.2 mm Hg) VS −0.4 mm Hg, 95%CI, −1.1 to +0.3 mm Hg respectively **4. Nurse or pharmacist led care (*n* = 12 rcts)** – Majority of the RCTS were associated with improved blood pressure control – Mean difference in SBP was reported in 10RCTsWhile mean difference in DBP was reported in 11 RCTs **5. Organisational intervention (*n* = 9 RCTs)** – Detection and follow-up programs produced substantial reductions in SBP and DBP 6. **Appointment reminder system (*n* = 8RCTs)** Reminder system (*N* = 5 RCTs) associated with an improved follow up		
12	Hacihasanoglu, R.	2011	RCT	– 120 subjects40-group A 40-group B 40-controls **Group A**-education in medication adherence **Group B**- Education in medication compliance in addition to education in healthy life style behaviors **Control group**	– Both interventions were effective – Group B (combined education) was more effective than medication adherence alone (Group A) on BP – Medication adherence/compliance self-efficacy Scale (MASES) scores of intervention groups were significantly increased – Most significant reduction in SBP and DBP was seen in intervention group B – SBP, DBP, MASES, HPLP and BMI were statistically significant ($p < 0.001$) for Group A &B except for control group – Group A and B number of patients who regularly used medication was significantly increased after education ($p < 0.001$) – No significant increase in control group ($p > 0.05$) **Conclusion/recommendations** – Results show the professional educational role of the nurse – Results indicate the importance of receiving nursing intervention for controlled BP, healthy lifestyle behavior and medication adherence self-efficacy – Educational interventions in hypertensive patients are efficacious in hypertension management and can make a major contribution to improvements in patient's healthy life style behavior, medication adherence, BP and BMI – Nurses working in primary health care facilities may confidently use both educational and counseling services to improve patient adherence and to lower BP	– Non use of standard physical measurement tools	Level 1 A
13	Wakefield, B.J.	2011	RCT	98% males 96% Caucasian 66% married 89% high- school education or higher	**Glycerine control A1c** – Control group did not show a significant change (−0.07, $p = 0.52$) – A1c changes in low and high intensity group decreased significantly (0.04, $p = 0.0003$) and 0.44 decrease ($p = 0.0001$) respectively at 6 months		Level 1 A

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Table 1 (*continued*)

#	1st author	Year	Level of research (or non-research) evidence	Sample composition & size	Results/recommendations	Limitations	Rating Strength Quality
				3 Treatment groups 1. High intensity group 2. Low intensity group 3. Usual care **Outcomes** A1c and SBP	**AT 12 months** – Control showed a significant decrease in A1c (0.33, $p = 0.001$) but no decrease in low intensity intervention group **SBP** – High intensity group showed a significant improvement ($p = 0.006$) compared to control group and close to significant improvement in the low-intensity intervention group ($p = 0.08$) **Conclusion/recommendations** Nurse monitoring and collaboration with the primary care physician, along with daily educational information and assessment, in the high intensity group resulted in positive outcomes of improved SBP		
14	Jiang, X.	2007	RCT	Two tertially medical centers in Chengdu, South West China Intervention and control groups	**Health behavior** – Intervention group demonstrated a significantly greater increase in the mean scores of walking performance, for Step II diet adherence than the control group – Medication adherence was found significant at 3 months – Adherence mean scores for both groups decreased but to significantly less in the intervention group **Smoking ceasation** – No significant difference in both groups between quitters at 3 and 6 months **Cardiac physiological risk parameters** At 3 months, a significantly greater reduction in TG, TC, LDL levels and a significant less increase in SBP and DBP in the intervention group At 6 months, significant greater reduction was only for TG, TC and LDL **Conclusions/recommendation** Results indicate the benefit of nurse-led cardiac rehabilitation intervention on health behavior improvement and cardiac physiological risk reduction for CHD patients through empowering patient in self-care and facilitation of daily rehabilitation self management	Difficulty in explaining the changes due to physiological risk parameters Short duration of the study	Leve 1 A
15	Clark, C.E.	2010	Systematic review and meta-analysis	$N = 33$ studies of RCTs of nursing intervention for hypertension compared toUsual care	**Use of a treatment algorithms** – 14 RCTs included a stepped treatment algorithms, 2 RCTs showed a greater magnitude of reductions in BP with the use of algorithms compared to usual care – All 4RCT studies showed a greater magnitude in reduction of systolic BP **Nurse prescribing** 9RCTs included nurse prescribing in their protocols 2 RCTs showed greater magnitudes of BP reductions for nurse prescribing **Telephone monitoring** 7 RCTS included telephone monitoring of blood pressure No significant difference for the outcome on SBP and DBP **Community monitoring** 8RCTs involved nurse interventions delivered outside health care setting. 4 RCTs showed a lower outcome systolic BP in favor of monitoring in the community. 2 RCTs showed a greater magnitude of blood pressure reduction in with community monitoring than usual care	– Data is from international perspective	Level 1 A

					Nurse-led clinics 14RCTs were of nurse-led clinics in primary care and 6 RCTs in secondary care setting 2RCTs showed no difference in DBP All pooled RCTs showed a greater magnitude of reduction in BP for nurse-led clinics compared with usual care **Ethnicity** Significantly lower SBP was achieved for any nurse led intervention for four groups **Cost and cost effectiveness** Only 4 RCTs presented any data **Conclusions** A 4 mm Hg greater reduction in diastolic BP with nurse prescribing than usual care, a 2 mm Hg reduction in DBP is associated with a 15% reduction in risk for stroke or transient ischemic attack in primary prevention – A 20-30% reduction in frequency of stroke and cardiovascular death was observed 3 mm Hg reduction in SBP – Nurse-led interventions for hypertension in primary care should include an algorithm to structure care and can deliver a greater BP reductions than usual care		
16	Carter B.L.	2009	Meta-analysis of RCTs	Nurse or pharmacy interventions	– 37RCTs met the inclusion criteria – Few studies described patient empowerment such as home BP monitoring – All studies acknowledged case management activities distinct from traditional nursing and pharmacy duties – Reduction in DBP was associated with referral to a specialist, providing patient education, completing a drug profile or medication history, pharmacist or nurse performed an intervention – Other factors associated with large effect size for SBP included; free medication, pharmacist made treatment recommendation to the physician, pharmacist performed intervention, drug treatment profile completed medical compliance assessed, counseling about lifestyle modification nurse performed interventionMean reduction in SBP was 5.84 (8.05) mm Hg for nursing studies compared to 7,76 (7.81) mm Hg involving pharmacists in clinics and 9.31 (5.0) mm Hg for community pharmacists – Reduction in DBP was 3.46 (4.15 mm Hg) for nursing studies, 4.18 (4.25) mm Hg involving pharmacists and 4.59 (4.64) mm Hg for community pharmacists **Conclusions/recommendation** – Interventions involving pharmacists or nurses where associated with a significant improved BP control – Team based care for hypertension found that interventions involving nurses or pharmacists are effective strategies to improve BP control	Most studies involving nurses did not specify their qualification – No specified training program was mentioned	Level 1 A
17	Ulm, K.	2010	RCT	19 physicians 200 patients (102 in intensive care group (ICG) and 98 to usual care group (UCG)	**After 6 months** 95% attended intensive care group 75% attended usual care group SBP had dropped significantly in the intensive care group and usual care group DBP also fell significantly in both groups Weight and time spent on physical exercises almost unchanged – A reduction in percentage of smokers in intensive care group from 14.7% to 8.4% **After 1 year** 78 patients in ICG 62 patients in UCG	– Small sample size – Not all patients motivated to provide the 24hr Bp reading – probable sample biasNo data on compliance was collected – Duration of the study too small	Level 1 B

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Table 1 (*continued*)

#	1st author	Year	Level of research (or non-research) evidence	Sample composition & size	Results/recommendations	Limitations	Rating Strength Quality
					SBP declined in both groups DBP declined in both groups Slight increase in physical activity by 1 h **Conclusion** – Study demonstrated that it is possible to improve BP control in the primary care environment by adapting an intensive care program managed by nurses and integrated in general care – Nurses could take more responsibilities for managing hypertension patients		
18	Hebert, P.L.	2011	RCT	416 African American or Hispanic patients with a history of uncontrolled hypertension – Patients with blood pressure of greater than or equal to 150/95 mm Hg – Patients with greater than or equal to 140/85 mm Hg with diabetes and renal diseases **Intervention** – Usual care – Home blood pressure monitor and in-person counselling session and a 9 month telephone follow-up – Home monitoring alone **Main outcomes** – Change in systolic and diastolic blood pressure at 9 and 18 months	Changes in systolic blood pressure from baseline at 9 months relative to usual care (7 mm Hg, 95% CI, −13.4 to 0.6) in the nurse management plus home blood pressure monitor arm A higher BP achieved (+1.1 mm Hg) in the home blood pressure monitor only No difference in the treatment arms after 18 months No statistical difference in the diastolic pressure in all the treatment arms at 9 and 18 months Changes in the prescribing practice did not explain the decrease in BP in nurse management arm **Conclusions** A nurse management intervention combining an in-person visit, periodic phone calls and home blood pressure monitoring over 9 months is associated with significant reduction in systolic but not diastolic	The difference in the demographic characteristics of patients recruited earlier in the study Loss-to-follow-up was substantial Frequent support given by the nurses could explain the reduction in nurse management arm	Level 1 A

subject. In order to purify the search, search limits were set to only include articles published in English in the past five years, involving only human subjects, adults age 19 years or older and involving an intervention by the nurse/pharmacist or physician and in a primary, secondary or acute care setting. Five years-search limit was applied as inclusion criteria to extract studies reporting current practices and strategies for high blood pressure control. Eighteen (18) studies met all the inclusion criteria and considered for the review study.

3.3. Data extraction

Data extraction was conducted with the help of the standardized data extraction forms used by Johns Hopkins Hospital and Johns Hopkins University (Table 1) obtainable online. With the use of the JHNEBP Research Evidence and JHNEBP Non-Research Appraisal forms, eighteen (18) studies were analyzed for the quality and level of evidence and summarized into tables. The data extraction forms were then checked independently by the reviewer (KB) for accuracy and completeness. Where a disagreement occurred, consensus was reached after arbitration by third reviewer (SG).

4. Results

4.1. Included studies

All the eighteen (18) appraised studies met the inclusion criteria for the integrative review. All 18 studies were appraised and categorized as follows; 10 randomized control trials (RCTs), 3 systematic reviews of RCTs without meta-analysis, 3 systematic reviews of RCTs with meta-analysis, 1 descriptive analysis and 1 nationally recognized expert committee (Table 1). Forty-two (42) of the 60 studies that had passed the initial screening were excluded after a review of their full texts having been found unsuitable for further assessment. A formal meta-analysis was not conducted due to heterogeneity of the methods and participants used in the individual studies.

4.1.1. Effectiveness of nurse-led care and HBP control

The majority of the good quality studies (Level-B) demonstrated the effectiveness of nurse-led care interventions in blood pressure control (Bosworth et al., 2011; Denver, Barnard, Woolfson, & Earle, 2003; Fahey, Schroeder, & Ebrahim, 2005; Glynn et al., 2010; Maher et al., 2011; McLean et al., 2008). A study by Bosworth et al. (2011) revealed that, there was a significant control of blood pressure by 12% (95%.CI, 16–24.1%) in the behavioral management group. Additionally, over half of the patients enrolled had adequate blood control from baseline. Interestingly, systolic blood pressure was significantly lower (−9 mm Hg, CI 95% 14.5–1.4, $p = 0.02$) than in the medication arm at 12months. Furthermore, nurse-led interventions demonstrated improvement of high blood pressure control in the short term (Bosworth et al., 2011). Other good quality studies (Level 1A-B) demonstrated significant outcomes for nurse-led interventions with respect to better blood pressure controls (Fulwood et al., 2006; Glynn et al., 2010; Maher et al., 2011). A study by Clark, Smith, Taylor, and Campbell (2010) demonstrated a 4 mm Hg reduction in diastolic BP with nurse prescribing. Similarly, a 2 mm Hg reduction in diastolic blood pressure (DBP) was noted and linked to a 15% risk reduction for stroke or transient ischemic attack (TIA) in primary prevention, translating into a 20–30% reduction in frequency of stroke and cardiovascular death (Clark et al., 2010). These findings are in line with another study by that support the notion of blood pressure control in the primary care environment could be achieved by adapting an intensive care program managed by the nurses (Ulm et al., 2010). Another study conducted in Sub-Saharan region supports nurse-led care interventions when task shifting strategy is used in the control of high blood pressure and other non-communicable diseases such as diabetes (Lekoubou et al., 2010). Considering the scarcity of human resources for health occurring in the Sub-Saharan region, Clark et al. (2010) study provides one of the best available evidence that supports the effectiveness and benefits of nurse-led intervention for blood pressure control. In the same study, risk reduction rates for strokes associated with uncontrolled, unmanaged and poorly treated hypertension (WHO, 2010) are reported (Clark et al., 2010).

4.1.2. Effective evidence based strategies for blood pressure control

Numerous studies identified effective evidence based strategies in the control of high blood pressure used by nurses and or physicians. Good quality studies demonstrated that, use of treatment algorithms, nurse prescribing, community monitoring are effective evidence based strategies that significantly reduced both systolic and diastolic blood pressure (Clark et al., 2010; Denver et al., 2003; Kotseva et al., 2010). Although there was no significant difference in the systolic and diastolic blood pressure with telephone monitoring (Clark et al., 2010), self-monitoring, education intervention directed to patients and health care professional, organization intervention and use of appointment reminder system were all associated with improved blood pressure and improved patient attendance and follow-ups (Baig et al., 2010; Fahey et al., 2005; Hebert et al., 2011). Similarly, non-personal health interventions such as health education directed to patients through mass media were associated with reduced high blood pressure (Murray et al., 2003). Population based strategies are equally important components for any comprehensive plan to prevent high blood pressure in communities (Whelton et al., 2002). Public health approaches targeted to lower sodium content in the food supply, provision of attractive, safe and convenient places for exercises are identified to lower blood pressure in communities (Whelton et al., 2002).

Similarly, numerous studies demonstrated that nurses' role in patient education significantly improved patients' health lifestyle behaviors, medication adherence self-efficacy, and reduced body mass index. These are regarded as important facets for long term control of blood pressure in communities (Clark et al., 2010; Fahey et al., 2005; Glynn et al., 2010; Hacihasanoglu and Gozum, 2011). This calls for nurses' educational preparedness to practice to their full scope through maximizing health education strategy.

4.1.3. Adapting nurse-led care interventions in Uganda health care system

An outcome based pilot study conducted in Uganda demonstrated that nurses had improved knowledge, skills and attitudes in the management of high blood pressure after implementing an educational intervention (Katende et al., 2014). The study was implemented by using the WHO guidelines as a strategy to improve nurses' use of evidence based practice. The results from the study were achievable through a multimodal approach that involved one- on-one supervision and provider feedback (Katende et al., 2014). The long-term goal for the study was to improve nurses' use of evidence based guidelines to control high blood pressure especially in primary health care facilities where scarcities of accessing a physician are evident. Patient retention in chronic disease management poses a challenge. In Cameroon, a nurse- led intervention study demonstrated improved patient retention of 25.8% in the hypertension program within one year of enrollment and increased access to health care services with low costs (Labhardt, Balo, Ndam, Manga, & Stoll, 2011). Findings of this study and other studies could be used to implement similar and large nurse-led care interventions programs for other non-communicable diseases in Uganda.

4.2. Implication for research and practice

Currently, there are no local, regional, or national programs or policies that address issues related to cardiovascular diseases, unhealthy diet, overweight, obesity, tobacco use and physical inactivity in Uganda (WHO-NCD, 2011). Policies that address these issues need to be developed to support non-communicable disease management and prevention in Uganda. The starting point should focus on hypertension and diabetes that currently have documented high prevalence.

Considering nurses and midwives as intermediate strategy to alleviate the human resource crisis using the task shifting policy, there is need for adequate preparation of the nurses to practice in the expanded roles (Katende et al., 2014). Such preparations must use evidence based strategies that provide nurses the opportunity to reflect on their own practices. Nurses should employ blood pressure self-monitoring, appointment reminder system, and telephone monitoring when caring for patients with other non-communicable diseases for improved patient outcomes (Carter, Rogers, Daly, Zheng, & James, 2009; Ireland, Mackenzie, Gould, Koper, & LeBlanc, 2010; Magid et al., 2011; Pezzin et al., 2011).

Numerous studies need to be conducted to support and augment the available evidence on the effectiveness of nurse-led care interventions for high blood pressure control with lessons learned in HIV care. Standard guidelines or treatment algorithms to support nurses in practice and working in primary health care facilities in low resource settings need to be widely disseminated.

4.3. Study strengths

Only studies of good quality were used to draw up conclusions for the current study.

5. Limitations

The heterogeneity of the pool of studies did not provide an opportunity for further statistical analysis affecting the generalizability of the results. Still, fewer good quality studies on high blood pressure control interventions in primary care settings are available in sub Saharan region.

6. Conclusion

Considering that nurses' roles remain significant in health care delivery, the current study demonstrated the effectiveness of nurse-led care interventions in the control of high blood pressure. Numerous effective evidence based strategies used by the nurses in the control of high blood pressure included but not limited to; use of treatment algorithms, nurse prescribing, community monitoring, self-monitoring as well as directing education to providers and patients. Adapting effective evidence based strategies in identification, prevention and management of non-communicable diseases could improve patient outcomes in Uganda.

Conflict of interest

There is no conflict of interest concerning this manuscript.

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